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remainder are photographs of Alpine scenes. There are also four small folded maps as follows: A. Europe during the second glacial epoch; B. Europe in interglacial times; C. Europe during the third glacial epoch; D. Europe during the fourth glacial epoch. The fourth glacial epoch as interpreted by Geikie corresponds to only the early part of the fourth or Würm Stage of Alpine glaciation. The fifth and sixth glacial stages of Geikie's classification seem likely to be represented in America by such strong readvances of the ice as the readvance to the Port Huron morainic system.

The aim of the author has been to deal with the question of the antiquity of man in Europe from the geological standpoint, and he maintains that it is chiefly by following geological methods of investigation that the successive stages of human culture are put on a firm and reliable basis. The discussion is restricted wholly to Europe with no reference to Asiatic invasions. In fact no intimation is given that the present people in Europe had any other line of descent than through the Paleolithic and Neolithic man. The earliest Paleolithic man is, on geological grounds, estimated to have appeared somewhere between 250,000 and 500,000 years ago. A more precise estimate is not considered possible in the present state of knowledge.

FRANK LEVERETT

ANN ARBOR, MICHIGAN

Twenty-second Annual Report of the Bureau of Mines, Ontario. Vol. XXII, Part I, 1913. By THOMAS W. GIBSON. Pp. 284, pls. 84, sketch maps 5, sheet maps 4.

This bulletin contains ten articles and reports. It commences with a review of the mining operations and production of the province during the year 1912. The value of the mineral output was $48,341,612—15 per cent greater than that of 1911. The decreasing production of the Cobalt region was compensated by a great enough rise in the price of silver to show an increase in the total value produced during the year. The Porcupine region added a million and three-quarters dollars' worth of gold to the annual output of the province. The year showed an increase in the output of both metallic and non-metallic minerals, but a much greater increase in the metallic.

The mines of Ontario are described by Mr. E. T. Corkell. He gives details of mine development, treatment of the ores, and production of the mines.

The geology of Whiskey Lake and the Massey Copper Mine area is reported upon by Dr. A. P. Coleman. The former workings were made first for copper and later for gold. The latter district has been worked for copper. Neither of the districts is commercially productive.

With the addition of the District of Patricia, the province of Ontario was given a location for a railway terminus at the mouth of Nelson River within territory formerly included in Manitoba. The location and surveying of this section are reported by Mr. J. B. Tyrrell. He describes his reconnaissance observations upon the agricultural and geological features of the parts of Patricia which he visited. In the northern part, the ancient crystalline rocks are overlain by fossil-bearing Ordovician and Silurian rocks. The Labradorean ice sheet deposited enough of a till covering upon the bared rocks of the northern part of the region to offer considerable agricultural possibilities. There are many instances of rock scorings of two glacial sheets. These are the Patrician and the Labradorean ice sheets. In Trout Lake region there is one set of striations which runs north 25° to north 40° west, planed and grooved by a glacier which moved south 40° west. The first striae were made by the Patrician glacier, which had its center in the highland southeast of Trout Lake; the later glaciation from the northeast was that of the Labradorean ice sheet. Upon the Hayes River, Mr. Tyrrell found evidence of the westward movement of the Patrician glacier followed by a southeastward advance of the Keewatin glacier. He considers, therefore, that the Patrician ice sheet preceded both the Labradorean and the Keewatin invasions in this region.

Mr. A. L. Parsons deals with the Lake of the Woods and other mineral areas in northwestern Ontario. He gives a detailed description of many of the ancient rocks of the region. A brecciated contact between granite bosses and Keewatin rock is common. The explanation offered is that the granite was intruded between the highly schistose layers of the metamorphosed Keewatin rocks. In most of the massive Keewatin rocks this contact breccia gives place to coarser, banded structure.

The West Shining Tree Gold area is described by Mr. R. B. Stewart. The rocks are chiefly of Keewatin age. The gold content is in quartz veins. The veins are very irregular in size and persistence; they are generally less than 4–6 feet wide and break into stringers. Many of the veins contain visible gold. A large amount of gold has been deposited along the fracture lines of the quartz, and a little in the bordering schists. The district is only in the very first stages of development.

"Glacial Phenomena of Toronto and Vicinity," by Dr. A. P. Coleman, and "Moraines North of Toronto," by Mr. Frank B. Taylor, are articles dealing with the glacial developments near the city of Toronto. The most interesting feature of the region is the Toronto interglacial formation which includes the Scarboro and the Don beds. The Don beds furnish many fossils of plants and shellfish. Among vertebrate fossils the remains of a bear, a bison, and two kinds of deer have been recognized. The whole assemblage of plants and animals implies a warmer climate than is there at present; one is implied comparable to the present climate of Ohio or Pennsylvania. The Scarboro beds have yielded fossils of 72 species of beetles and 3 mosses; these remains betoken a cool climate. During the Don interglacial period climatic conditions must have been such as to preclude the presence of an ice sheet within hundreds of miles of Toronto.

T. T. Q.

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1. *Glaciation of the Puget Sound Region.* By J. HARLEN BRETZ. Washington Geol. Survey Bull. 8. 1913. Pp. 244, pls. 24, figs. 27, maps 3.
2. *Bibliography of Washington Geology and Geography.* By GRETCHEN O'DONNELL. Washington Geol. Survey Bull. 12. 1913. Pp. 64.
3. *Geology and Ore Deposits of the Covada Mining District.* By CHARLES E. WEAVER. Washington Geol. Survey Bull. 16. 1913. Pp. 87, pls. 5, figs. 3.

1. The area studied stretches from the Canadian border 170 miles south to the divide between the Chehalis and Columbia rivers, and from the base of the Cascade Mountains to the Olympics, about 50 miles east and west. This region has been studied by several other geologists; but hitherto the glacial geology has not been so thoroughly treated as in this report. It is a detailed study of the region which discusses the Pleistocene history and later diastrophism. Terminal moraines, recessional moraines, extra-morainic outwash, the formation of glacial lakes, and drainage changes are the principal topics discussed in connection with the drift.

The submarine features are as remarkable as the surficial deposits. The region is characterized by deep marine channels or troughs. The greatest trough, that of Puget Sound, contains Admiralty Inlet, 60 miles